

of irregular appearance, 80 as stragglers, and 6 as doubtful. Two "ornithological calendars," one giving the times of "migration" and the other those of "nidification," add considerably to the value of this useful work, which must not only of necessity be in the hands of every Italian ornithologist, but which every student of the European Ornis, or of any constituent parts, should have for reference. We trust that the good example thus set by England, America, and Italy will lead to the publication of other similar hand-books.

OUR BOOK SHELF

The Law of Storms, considered practically. By W. H. Rosser. Second Edition. (London: Norie and Wilson, 1886.)

WE welcome with much pleasure the second edition of this useful little work on storms practically considered. The first edition, briefly noticed by us at the time (vol. xiv. p. 504) appeared ten years ago. Since then the researches of meteorologists have materially advanced the science, notably in establishing on a firmer basis the law of the in-moving spiral circulation of the wind in cyclones, and defining with some exactness the limits of variation of the angle of inclination of the winds as they blow inwards toward the centre of storms. In this view especially the last part of the work has been recast, recent investigations being summarised with no little ability, and the results thereafter applied to navigation. The book, which is professedly a practical one, is specially and admirably adapted to give seamen the best available information in handling their ships in storms.

Ueber Manatherium delheidi, eine Sirene aus dem Oligocän Belgiens. Von Dr. Clemens Hartlaub. *Zool. Jahrb.*, vol. i. (1886).

DR. CLEMENS HARTLAUB'S excellent contributions to our knowledge of the recent Sirenians have lately been noticed in these columns (July 8, p. 214). We have now before us his essay on an extinct form of the same peculiar group of mammals. The luxuriance of fossil forms of the Oligocene of Belgium is well known to all zoologists. Upon materials gathered from the Superior Rupelian beds of Hoboken, near Antwerp, which have already produced remains of *Crassitherium* and *Haltitherium*, Dr. Hartlaub finds a new genus of Sirenians, nearly allied to the living Manatee, which he proposes to call *Manatherium*. Its dentition, so far as it is at present known to us, does not materially differ from that of *Manatus*, of which, indeed, it may have been the immediate progenitor; and the necessity for its generic separation from its modern representative is perhaps not altogether evident. The species is named *Manatherium delheidi*, from M. E. Delheid, in whose cabinet of Belgian fossils the remains upon which it is based are contained. Fossil species of true *Manatus* have been described by Leidy and other authors in America, and M. Filhol has assigned some African remains to the same genus. But *Manatherium delheidi* is at present the only European form described as belonging to this exact type of the Sirenians.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

The Tangent Scale in a Galvanometer

ON account of the correspondence which has recently taken place in this and other journals regarding the use of the tangent

scale in a galvanometer, when the plane of the coil makes an angle with the direction of the force in the magnetic field, the following extract from Sir William Thomson's patent, No. 4617 of 1883, and the accompanying remarks, may clear up some of the points that have been raised:—

"In using this instrument I sometimes cause the zero to be at one end of the scale, so that, when the potential is at the prescribed definite amount, the pointer is at the centre mark of the scale of tangents. The deflections are thus more easily observed, on account of the large size of the divisions."

This extract is quite explicit as to taking the zero at one end of the scale, and it is abundantly evident, from the text of the patent and from the illustrative drawings, that the scale referred to is a tangent scale. The essential feature in this use of the tangent scale is that the strength of the current is proportional to the difference between the tangents of the angle corresponding to zero and that corresponding to the deflection due to the current.

The total length of the scale, as shown in the patent already referred to, and used in this Laboratory for over two years, is 120°. Lately, however, the length of the scale has, with considerable advantage, been increased to 147° 8', thus giving twice the sensibility obtainable with the 120° scale.

As regards Prof. Carey Foster's letter to NATURE of October 7 (p. 546), a tangent galvanometer arranged to use the tangent scale in this manner is essentially adapted to measure currents which flow through its own coil in one direction only, but in these instruments, as designed by Sir William Thomson, the necessary accuracy is secured by the following procedure. The index (which has a range of about 95° on each side the middle point of the tangent scale) is caused to point to a mark exactly 90° from the middle point of the scale, and the relative positions of the coil and the scale are then adjusted, so that, when the index points to the 90° mark, the strongest current which can be safely sent through the coil produces no sensible deflection.

J. RENNIE

Physical Laboratory, the University, Glasgow, October 16

On the Connection between Chemical Constitution and Physiological Action

IN the address delivered by Dr. Brunton on this subject before the Section of Therapeutics and Pharmacology at the last meeting of the British Medical Association, a copy of which was published in NATURE, August 19, p. 375, he observes, in alluding to the adoption of more scientific methods in pharmacology:—"This may be said to have begun about twenty years ago, when the researches which my predecessor in this office, Dr. Fraser, made with Prof. Crum Brown upon the connection between physiological action and chemical constitution inaugurated a new era in pharmacology. . . . We might first date the beginning of this age from Blake's attempts to show that a connection exists between the forms in which the various bodies crystallise, and the mode in which they act on an animal body. . . . Nevertheless, I think we may fairly say that it was the experiments of Crum Brown and Fraser which fairly started pharmacology in the new direction in which it has since been steadily advancing." Now it can, I think, be shown that in these remarks Dr. Brunton has not only misunderstood the scope of my experiments, but that he has been led into error on account of his having no definite idea of the meaning of the term chemical constitution, which he has evidently confounded with that of chemical composition. The same confusion of these terms is not only apparent all through the address, but is also found in the paper on the subject by himself and Dr. Cash, published in the *Transactions* of the Royal Society, 1884.

The term chemical composition is well understood, but the meaning of the term chemical constitution is not so well defined. Perhaps the difference between the two terms may be pointed out in the shortest space by an example. If we take the salts of iron, for instance, we know that the salts of the protoxide have a chemical constitution analogous to the other members of the magnesian group with which they are isomorphous, and that this resemblance in constitution connotes not merely that they crystallise in analogous forms, as Dr. Brunton seems to imagine, but also that they form many analogous chemical compounds which resemble those of the other members of the same group more closely than the compounds of any other group. By the addition of oxygen to the protoxide, not only is its chemical composition changed from FeO to

Fe_2O_3 , but at the same time a base is formed, the compounds of which are totally different from those of the ferrous oxide, but which resemble in their chemical properties the salts of alumina, Al_2O_3 , with which they are isomorphous. Here there is evidently a change, not merely of composition, but of constitution; the addition of oxygen has not only altered the relative weight of the constituents, but has completely changed the structure of the molecule in a definite direction, and impressed on it a constitution analogous to that of the molecule, Al_2O_3 , with which it is isomorphous. Now, when I had shown that this change in the constitution of the salts of iron was attended by a marked change in their physiological action, when I had proved that the physiological action of the ferrous salts was analogous to that of the salts of the other members of the magnesian group, which they resemble in chemical constitution, and that the physiological action of the ferric salts was analogous to that of the salts of alumina with which they are isomorphous, and when it was proved that an analogous connection existed between the chemical constitution and physiological action of the compounds of the elements of all the more important isomorphous groups, I think nothing but a complete misapprehension of the meaning of the terms chemical constitution and isomorphism could have led Dr. Brunton to allude to my researches as an "attempt to show that a connection exists between the form in which various bodies crystallise and the mode in which they act on an animal body." The same error as regards the meaning of the term chemical constitution has led Dr. Brunton to fail to comprehend the bearing of the experiments of Crum Brown and Fraser on the question, on which, in fact, they throw no light, although evidently regarded by him as a beacon for subsequent observers. These gentlemen found that by the addition of an ethyl or methyl molecule to strychnia its physiological action was profoundly modified, and concluded that this was owing to the chemical constitution of the substance being changed. As they worked with a reagent, strychnine, of the chemical constitution of which we are still ignorant, it was impossible for them to know if the addition of an ethyl or methyl group had made any change in its chemical constitution. The probabilities are that no such change had taken place, as the new compounds were addition and not substitution compounds. It is not merely for asserting a claim to priority that I make this communication, although I think *suum cuique* a very good rule; but I wish to point out the causes which in my opinion are not only retarding the progress of physiology in this direction, but which are tending to throw it back to where it was before the publication of my earlier experiments nearly fifty years ago.

October 6

JAMES BLAKE

Relation of Coal-Dust to Explosions in Coal-Mines

It is a stubborn and grievous fact that the loss of life by explosions in coal-mines has risen in the last decade, although the number of explosions has fallen. This points clearly to some essential defect in the remedies adopted. The remedies in use apply apparently to one class of explosions only, hence the decrease in the number of explosions. But, unhappily, there are many to which they do not apply, and those the worst; hence the larger number of lives lost. Some research, which has much engaged me of late, and which I hope soon to make public, has led to the conclusion that possibly the reason of this is about to be, or is even already, detected.

Many, well competent to judge, have thought that too much attention has been given to *gas*, and too little to *dust*. This is a growing conviction, both in Germany and in England, and of late years the dust has had considerable attention. A work, recently published (September 1886) by Messrs. W. N. and J. B. Atkinson (Government Inspectors of Mines), entitled "Explosions in Coal-Mines," strives, and I think fully succeeds in establishing that many of the most disastrous colliery explosions in the last six years have been practically "*dust explosions*." My conclusion, from certain simple physical and chemical experiments, and from a most careful microscopic examination of coal-dust from various seams worked in this field, is that the Messrs. Atkinson's view is right, and, moreover, that the attention hitherto given to coal-dust has not only been useless, but absolutely pernicious, since it has lulled into a state of false security.

I have been down several typical coal-pits in this district (the Durham field), such as Seaham, Murton, Silksworth, Pelton, &c., and in some of them I have seen the water-pipes along the main haulage roads supplied at convenient distances with

stop-cocks, and have found the dust on such roads so damp as to be rendered harmless, if it had not been so already, but the fine dust which coats the upper faces of the roof-timbers was there untouched, lying often to the depth of half an inch. Now, the *bottom dust*, as we may call the former, I am prepared to prove is almost if not quite universally harmless; and the *upper dust*, as we may call the latter, I am equally prepared to prove is in the highest degree dangerous, and especially a certain portion of it, which I propose to call "*flocculent dust*." Lastly, I claim to be able to establish that the main source of the really dangerous dust is that portion of the coal called variously "*dant*," "*mother of coal*," and "*mineral charcoal*." The upper, and especially the flocculent dust, possesses physical and chemical properties wanting, or existing in the most shadowy form, in the bottom dust; and the microscopical aspect emphasises these differences, as well as shows the relation of the former to what is very appropriately called "*mineral charcoal*."

It would pass beyond the limits of a letter to enter into particulars, but the observations and opinions of others may be hereby evoked, and this good work of saving life and property be materially furthered by your kindly admission of this letter to your pages. I will now only add that this ordinary upper dust and this flocculent dust removed, or rendered innocuous, it is my firm conviction that the number of explosions will rapidly fall, and also the loss of life be greatly reduced. This is the goal of my effort. Some practical men may indicate means, and perhaps I, who am a student, may be permitted to suggest that keeping the ventilating air-current saturated with aqueous vapour, rather than direct watering, would, if it be practicable, both lessen the amount of this dangerous dust, and also facilitate its removal.

ARTHUR WATTS

Bede College, Durham, October 12

Volcanic Ash from New Zealand

A SAMPLE of the ash ejected during the recent eruption in New Zealand has just reached me through the kindness of Mr. W. Ferguson, Harbour Engineer, Wellington. It was collected sixty miles from the seat of the volcano.

The ash is of a gray colour, of a somewhat darker shade than that from Krakatō. The dark-coloured constituents of the New Zealand ash consist principally of black scoriaceous fragments and ferruginous particles of indefinite character; those of Krakatō consist mainly of magnetite and hypersthene, well defined. The following minerals are contained in the New Zealand ash:—

Plagioclase Feldspar, very fragmentary, limpid, showing polysynthetic striations in the polariscope, and sometimes medial twinning line. The few well-formed crystals observed recall the tabular forms from Krakatō (described in my paper, *Proc. Roy. Dublin Soc.*, vol. iv. p. 291). There is a notable absence of the cellular vesicular covering observed in the Krakatō feldspar, and so suggestive of the pulverisation of a ready-formed pumice.

Hornblende, in elongated prisms, sometimes fibrous longitudinally or striated; colour dark green, pleochroic green longitudinally to brown; extinction makes a small angle, less than 15° , with the prism axis; occurs occasionally included in the feldspars. It is scarce.

Biotite and a golden-coloured mica are common in well-formed crystals of hexagonal outline, remaining dark between crossed Nicols.

Iron Pyrites, free and in embedded grains; striated pale yellow octahedral forms. Scarce.

Magnetite, in lustrous black octahedral forms. Not abundant.

Sulphur, in small broken pale-yellow fragments; burns with the characteristic smell, held over a lamp. Scarce.

Glass, remaining dark between crossed Nicols; variously coloured and often containing crystallites arranged fluxionally. Common.

Of these minerals, mica, hornblende, and sulphur are, so far as my observations go, not present in the Krakatō ash. Comparing it with samples from Krakatō gathered at a comparable distance from the scene of eruption, the New Zealand ash suggests a more hastily formed material, the minerals in common being less perfectly developed in the New Zealand ash. I have not noticed as yet in this ash the hypersthene conspicuous in that of Krakatō. There are some organic remains, calcareous fragments of shells.

J. JOLY

Physical Laboratory, Trinity College, Dublin, October 18